TROPICAL AGRICULTURE

THE OFFICIAL JOURNAL OF THE
IMPERIAL COLLEGE OF TROPICAL AGRICULTURE

VOL. IV No. 7. JULY, 1927. PRICE 6d.

CONTENTS.

	PAGE.
Tropical Agriculture	121
Mr. H. C. Sampson, C.I.E.	122
Forestry (concluded)	123
The Castor Oil Plant	124
Illustration	ix
Insect Control in Hawaii (continued)	125
The Roots of Sugar-Canes	126
Indian Tea Statistics, 1925	127
Anise-Scented Oil of Bay	128
Synthetic Pen Manure	129
Tropical World Notes	130
Agricultural Departments	131
Electric Welding	132
College Amalgamated Clubs	134
Mycological Notes	135
British Association	135
Sugar Notes	136
Chemical Notes	137
Reviews	138
Books Received	138
College News	139
Trend of the Markets	140
Grading of Trinidad Cacao	140

THE IMPERIAL COLLEGE OF TROPICAL AGRICULTURE, TRINIDAD, B.W.I.

Cables :: "Stomata." | Phone :: 1983.

TROPICAL AGRICULTURE is published at the Imperial College of Tropical Agriculture, St. Augustine, Trinidad, West Indies, at the end of the third week of the month preceding the one of issue. Advertisement rates can be obtained at the College from the Editor, or from the Secretary of the College, 14, Trinity Square, London, E.C. 3, England. The Editor will be glad to consider authoritative articles for publication. It is understood that opinions expressed in signed articles are those of the author and do not necessarily represent the policy or opinion of the College Authorities. Increasing numbers of inquiries are being received from various parts of the tropics which can be answered only by persons possessed of an intimate knowledge of local conditions. Enquirers should first satisfy themselves that their local Department of Agriculture is not able to supply them with the desired information before communicating with us. Correspondence which will be replied to is invited on all other matters pertaining to tropical agriculture, science and development.

TROPICAL AGRICULTURE.

The Co-ordination of Research.

RESEARCH has of recent years become an important function of learned institutions, and trained specialists are continually increasing the wealth of knowledge by the contributions of their results to scientific and other publications. The work has necessarily tended to become more departmentalised and the number of publications multiplied. As a consequence workers in one branch of a subject find it difficult to keep in touch, and almost impossible to keep abreast of work done in other branches of their subject and related subjects. It may be that they have only an ill equipped library at their disposal, or, with a well equipped library they may reckon that time spent on original work is more valuable than time spent in perusing literature that may or may not be of direct value to them. Well directed expenditure alone will remedy the first difficulty, although a useful, but less satisfactory, alternative is given when facilities are provided for borrowing books from better equipped libraries. Last year a valuable project was put in hand in the United Kingdom with this object. Under the direction of Mr. Pollard of the British Museum, a World List of Scientific Periodicals was published. Libraries throughout the United Kingdom were required to put opposite the title of each periodical —these were arranged in alphabetical order and numbered consecutively—a key letter denoting their library together with the time extent of their series. Recently an index of these entries has been issued in a separate volume. A researcher can now find the number of the periodical he wants, look up the index and find a list of the places possessing the journal, and can procure the work by application to his local librarian. The second difficulty—that of being awed by the vast extent of published work—has been provided for in many subjects, and such provision tends to extend. Classified botanical and chemical abstracts ease the scouring of current literature, and abstracts of relevant literature are being more and more incorporated into journals on special subjects, such as, for example, cotton. As one can quite understand, the research worker in the tropics is in a particularly bad position with regard to sources of useful information. The specialist agricultural officer is comparatively isolated, as a rule he has few journals at his command, and, although he may receive information about work in other parts through the medium of agricultural journals,

the information contained therein is often necessarily of a popular character, whilst much valuable work done on problems that are of general interest throughout the tropics reposes in places that are inaccessible through being unknown. It is therefore, with pleasure that one reads those sections on "Collection and Dissemination of Information" and the "Organisation of Research" which are contained in the valuable report (Cmd. 2825) on "Agricultural Research and Administration in the Non-Self-Governing Dependencies." First appointed to report on the recruitment and training of officers for the agricultural departments of the Non-Self-Governing Dependencies, the terms of reference of the Committees were later extended to cover the general question of how best to improve the efficiency of agricultural administration and research, and the sections which have been referred to deal with this. From evidence submitted, the Committee came to the conclusion that existing arrangements for collecting and disseminating reports, preserving and indexing information, are inadequate and that officers are often working upon problems without knowledge of the results already obtained by investigators into the same or similar problems. The need for co-ordinating is thus shown, and the report, after describing existing institutions, goes on to make extremely useful suggestions. The monthly publications of the Imperial Bureaux of Entomology and Mycology are regarded as quite satisfactory for those two subjects and it is recommended that the methods adopted should form a basis for work outside those branches. It is suggested that specialised officers should send reports of their researches to a central office which would collect and index the papers received. The information could then be circulated classified according to subject. The obvious place for such a clearing house would be within the United Kingdom and it is considered that the Imperial Institute is the body best qualified and adapted to organise this work, more especially as the collection and dissemination of information relating to raw material is already included amongst its statutory functions. Finance is always a major consideration, and it is interesting to read that the Committee are strongly of opinion that there is no service upon which money devoted to agricultural research could more prudently be spent than upon arrangements for collecting, recording and disseminating the results of investigations in agricultural science, and that the adoption of their recommendation would result in the most economical as well as the most efficient method of providing for this very important service. In dealing with the complementary problem of the organisation of research, the Committee was convinced of the necessity for a co-ordinating research organisation. The proposed organisation should be able to provide the Secretary of State for the Colonies with the best available technical advice, at the same time it should be possible to focus the maximum scientific power of the Empire on Colonial agricultural problems when necessary. Consequently any scheme should bring into touch Colonial agricultural departments and other research institutions in the Colonies; research institutions and workers in this country and elsewhere; the Colonial Office; also the trades interested in Colonial agricultural products. On consideration of these points the scheme proposed is as follows: Specialist Officers in the agricultural departments are linked up with Central Research Stations, such as the Imperial College of Tropical Agriculture; these, together with research institutions in the United Kingdom are connected to an Advisory Council on Colonial Agricultural Research. The economic side of tropical crops is dealt with by Product Committees which are sub-sections of the Advisory Council on Plant and Animal Products of the Imperial Institute and deal with producers, trade, information, &c.—this section is also linked up to the Advisory Council on Colonial Agricultural Research. The main function of the Central Research Stations will be to place at the disposal of the Colonies in its group, for the purpose of attacking the more difficult problems confronting them, staff and equipment which they cannot individually afford to maintain. Although a certain amount of minor educational work may be undertaken, except in the case of the Imperial College which has already begun to take a vital part in the training of Colonial agricultural officers, the main duty of the stations will be research. Advice and assistance will be available to specialist officers and on occasion they may be sent for a period to the central station to work at their own problems. It is intended that the key stone of the proposed organisation—the Advisory Council—shall act in an advisory capacity to the Colonial Office, and provisions for close contact between the Council and the Colonies prevent it from becoming detached, whilst the settlement of its location makes for still surer co-ordination.

MR. H. C. SAMPSON, C.I.E.

THE appointment of Mr. Sampson as Economic Botanist has brought into prominence the fact that the Royal Botanic Gardens, Kew, are evidently contemplating a new and progressive policy and are anxious to get into closer contact with the various Botanic Stations, throughout the Empire. Mr. Sampson has had a long and distinguished career in scientific agriculture in the Tropics. After a short period of service in the Transvaal Agricultural Department, he was transferred to India and spent most of his service in the Madras Presidency, where he eventually rose to the position of Director of Agriculture. He retired from the Indian Agricultural Department in 1923 and took up a position as cotton specialist for Nyasaland under the Empire Cotton Growing Corporation.

G. E.

FORESTRY.

Imperial Conference, 1926.

APPENDIX II.

Australian-New Zealand Empire Forestry Conference of 1928.

The preliminary agenda has been drawn up as follows :—

(i) Progress Reports (based on Questionnaire).

Subjects of Imperial Interest.

(ii) Timber Supply and Consumption.
(*a*) World. (*b*) Regional. (*c*) Local.

(iii) Forestry Research.
(*a*) The Living Tree and Forest.
(1) Silviculture and Management.
(2) Entomology and Mycology.
(*b*) Forest Products.
(1) Major Products.
(2) Minor Products.
(3) Pulp.

(iv) Forestry Technique.
(*a*) Silviculture and Management.
(*b*) Exotics.

(v) Imperial Forestry Bureau.

Subjects of Local Interest.

(vi) Forestry Education.

(vii) Australian Hardwoods and Markets.

(viii) The Taxaceae.

(ix) Forestry in relation to Climate and Erosion.

(x) Tropical Forestry, with special reference to the Forests of Queensland and New Guinea.

(xi) Fire Control.

APPENDIX III.

Memorandum on State Forestry in relation to Land Settlement.

The underlying principle of modern forestry is to secure continuous production of timber from the soil. The practice of forest cultivation (silviculture) means outlay of money which goes almost wholly in wages. Silvicultural work is usually seasonal to some extent but a certain amount of such work can be undertaken at the time most convenient to local labour. There arises the possibility, therefore, of settling forest workers on agricultural land in the vicinity of forests on holdings not large enough to demand their whole time but big enough to keep them employed when forest operations are slack.

The essentials of success in these schemes of settlement are :—

(*a*) Classification of the land into forest and agricultural land.

(*b*) Management of the forest for continuous production.

(*c*) In the case of afforestation, distribution of the planting work over such a period of years that thinning or preparation (*i.e.*, making roads, &c.) for thinning operations are begining when planting is completed.

(*d*) Selection of suitable men for the holdings.

(*e*) Reasonable equipment of the holdings.

APPENDIX IV.

Memorandum on Forest Products Research within the British Empire.

There has been much progress of recent years and there are now well equipped Forest Products Research Laboratories or similar Institutions in Canada, India and South Africa and a laboratory is now being established in England. The need for close co-operation is of great importance. It is noticeable that in countries possessing Forest Products Laboratories success in finding new markets and uses for various timbers has been materially greater than in those in which such institutions do not exist.

APPENDIX V.

Note on Imperial Forestry Institute.

The total forest area of the Empire is estimated at 1,837,000 square miles of which some 685,000 square miles are at present, accessible and marketable. Much of this has been depleted by wasteful methods of working and will require very careful handling. The importance of providing a thoroughly capable staff to administer and work this vast property, and of training research workers to deal with the many problems affecting its management, scarcely requires to be emphasized.

Arising out of the British Empire Forestry Conference of 1920, an Inter-departmental Committee of 1921 and the Conference of 1923 the Imperial Forestry Institute was established at Oxford in October, 1924 for the higher training of Forest Officers.

APPENDIX VI.

Note on the Empire Forestry Association.

The objects of this association of which H.R.H. The Prince of Wales is president are :—

(i) To create interest and circulate information relating to forestry among all classes in the British Empire.

(ii) To bring about better public recognition of the identity of interest between continuous timber supplies and systematic forest management, and to spread information relating to the commercial utilisation of Empire-grown timbers and forest products.

(iii) To form a centre for the Empire for those engaged in forestry and to provide a means of communication between the widely-scattered members.

The official organ of the Association is the Empire Forestry Journal which is published twice annually ; it is hoped that before long funds may permit of a quarterly circulation.

R. C. M.

An article in *The Times*, 2nd May, gave an account of the Banana research work of the College.

THE CASTOR OIL PLANT.

(*Ricinus communis*).

Black rot in the Gezira.

BY R. G. ARCHIBALD, M.D., D.S.O.
Director, Wellcome Tropical Research Laboratories, Khartoum.

DURING the course of some investigations on a bacterial disease of cotton, the writer's attention was directed by Mr. Beford, Assistant Government Entomologist, Gezira Research Farm, to a disease attacking the castor oil plants in the farm garden. The manifestations of the disease simulated at first sight Angular Leaf Spot and Black Arm disease of cotton, the lesions occurring as blackened areas on the under surface of the leaves and also on the stems of the affected plants. On the leaves the initial lesions appeared to originate in the stomata and in the margin of the mid rib, in its early stage appearing as watersoaked dark areas which in time became dry jet black in colour (Plate 1), the leaf eventually presenting a yellow shrivelled appearance followed by shedding. On the stems a very similar effect was produced, the early watersoaked dark green appearance of the early lesion being followed by a blackening of the affected area. (Plate 2.)

Some plants showed lesions only on the leaves; in others both stem and leaves were attacked resulting in wilting of the foliage and leaf fall.

Cause of the disease.

Scrapings from the early and old lesions showed the presence of large numbers of non-motile, Gram negative bacteria which, in the case of the leaves, were most abundant in the stomata; scrapings from the stems also demonstrated the presence of non-motile, Gram negative bacteria, sections showing these attacking the parenchyma rather than the vascular tissue. To obtain the bacillus in pure culture, the following technique was adopted: scrapings from the lesions were removed with a sterile knife and dipped in a watch glass containing absolute alcohol then washed twice in sterile distilled water and crushed with a sterile knife, the resulting emulsion being used for inoculating various culture media.

Cultural and other characters of the bacillus.

The bacillus obtained in cultures from the lesions on the leaves and stems was non-motile, non spore-bearing, Gram negative and non acidfast, measuring .002 mm. × .0002 mm.; it was strictly aërobic, growing readily in the ordinary culture media of the laboratory at an optimum temperature of 30°C. ceasing to grow however, at 37°C.

Broth.

In broth pH 7.6 the bacillus grew readily producing in 48 hours a fine turbidity.

Agar.

In 48 hours a viscid dull grey growth slightly raised from the surface. After 72 hours the culture medium assumed a brownish colour which eventually deepened to a dark amber colour.

Loeffler's blood serum.

A smooth white glistening growth which became cream coloured in three to four days with commencing liquefaction of the medium. At the end of ten days most of the medium was liquefied.

Potato.

In 48 hours a white viscid growth with glistening surface. On the fourth day the growth assumed a brownish colour.

Gelatine.

Stab cultures at 25° C. showed a small smooth white growth after 72 hours. Cultures 21 days old showed no liquefaction.

Biochemical reactions.

Neither acid nor gas occurred in glucose, laevulose, galactose, rhamnose, maltose, lactose, saccharose, raffinose, dextrin, inulin, starch, glycerol, erythrol, adonitol, dulcitol, and mannitol. In salicin, acid was produced. The bacillus gave a negative indol and negative Voges-Proskauer reaction, and failed to reduce nitrates.

Inoculation experiments.

The results of these experiments established the relationship of the bacillus to the disease.

Healthy castor oil plants in the Khartoum laboratory garden, where no evidence of the disease existed, were selected. Superficial abrasions by means of a fine needle were made on the under surface of the leaves and on the stems of healthy plants. Emulsions of agar cultures of the bacillus in sterile distilled water were applied to the abrasions by means of a pipette. Control inoculations were also made with sterile distilled water applied to abraded surfaces of leaves and stems of healthy plants. The control plants were unaffected, whereas the disease was reproduced in plants inoculated with the culture emulsions of the bacillus; on the leaves typical lesions appeared on the eighth day and on the stems similar lesions occurred on the ninth day following inoculation. (Plate 3.)

Cotton plants, Sakel and American, were similarly inoculated with emulsions of the bacillus without ill effects.

The pathogenic properties of the bacillus for other plants were not determined.

Method of infection of the plants.

Although no attempts were made to prove the method of infection, evidence suggests that the disease was probably insect-borne for the writer, at the time of these investigations, was engaged in examining large numbers of soil and water cultures from this area, and in no instance, was the above described bacillus obtained.

Remarks.

Smith and Godfrey [1] have described a brown rot of Solanaceae which attacked and did serious damage to fields of *Ricinus communis* in Georgia and Florida. The casual agent of this brown rot was *Phytomonas solanaceaea*—an organism differing in cultural and other characters from that attacking the castor oil plants in the Gezira.

The Castor Oil Plant.

See page 124.

LEAF INFECTION SHOWING THE DARK AREAS.

STEM INFECTION.

STEM INFECTION, THE RESULTS OF INOCULATION WITH A CULTURE OF THE BACILLUS.

In the literature available, no reference exists recording this bacillus as a plant pathogen. To classify it correctly, use has been made of Bergey's Determinative Bacteriology. The characters of the bacillus places it in the tribe Erwineae genus Phytomonas and it is proposed to name the species *Phytomonas ricini* n.s.

Summary.

A short account is given of a black rot attacking the castor oil plant *Ricinus communis* in the Gezira caused by an organism for which the name *Phytomonas ricini* n. sp. is proposed.

(1) Smith and Godfrey. Brown Rot of Solanaceæ on Ricinus. *Science*, N. S., Vol. XLVIII, July 12, 1918.

INSECT CONTROL IN HAWAII.

(*Continued.*)

Other insect Pests.

Coccidae and Aphides.—Only incidental reference has so far been made to the early work by Koebele. These efforts were largely concerned with the introduction of various Coccinellidae with a view to the control of certain scale insects and aphides. In 1894-5 Koebele went on an extensive tour in Australia, Ceylon, China and Japan in search of beneficial insects, and a great deal of material was brought to Honolulu. Although a number of the species subsequently failed to maintain themselves in the Islands, others proved successful. The success of the latter, in fact, appears to have been so complete that little is now heard of the pests in question. Of the species that were introduced, became established and remained effective, the most important are *Cryptolaemus montrouzieri* Muls. and *Coelophora inaequalis* (Fabr.). The first-mentioned species was introduced from Australia into California and reached Honolulu *via* the latter country. Its great efficiency is recorded by Perkins (1925), who remarks that "In 1892, throughout the Kona district, where I was then stationed, *Pulvinaria* covered many of the trees, which were in a dying condition and many, in fact were dead. After the *Cryptolaemus* was taken there, this scale to a large extent disappeared. There may be some who still remember the strange appearance of the trunks of many of the larger ornamental trees in Honolulu in June, 1896, when the *Cryptolaemus* larvae, having become full-grown, congregated together so as to form large white patches covering several square feet of the surface, which was entirely hidden by them. Owing to the white covering of the larvae many people mistook these for scale insects and were actually destroying them."

The *Coelophora* was introduced from Ceylon, Australia and China. That it proved not less effective, as regards the destruction of aphides, may be gathered from the following remarks by that same authority. "In June 1895, many of the native trees in the kipukas that are found in the forest at various parts within eight or ten miles of the crater of Kilauea were covered with a conspicuous black Aphid and others less noticeable. Many of the *Pelea* trees, especially, were in a dead or dying condition, but other forest trees were affected. At this time single specimens of *Coelophora* were rarely noticed, having evidently just arrived at the locality. In September the ladybirds were in thousands and when the same places were revisited in August, 1896, we were unable to find even a single specimen of the large black Aphid."

Other ladybirds introduced and successfully established included *Rhizobius ventralis*, Erich., introduced from Australia *via* California, preying upon mealy bugs: *Orcus chalybeus* (Boisd), introduced from Australia, preying upon Diaspine scale insects and *Platyomus lividigaster* Muls., also introduced from Australia, upon aphides. In addition to the afore-mentioned species there were others less conspicuously successful, some failing to increase sufficiently as to be of noticeable value. It has been, however, the combined work of a number of species that has greatly restrained such pests as coccids and aphides. It is necessary also to mention that thirty or more species of minute Chalcid parasites have been introduced by Koebele and others to prey upon scale insects, and with respect to these Perkins remarks: "No record exists of the minute scale parasites which were frequently sent. For instance, it is quite uncertain whether some of the established parasites on scales were the results of his sendings or whether they came by other means, but it is hardly probable that of the large number of species sent none survived, even though they had no expert handling on arrival."

Cutworms and Army worms.—Cutworms and army worms number thirty-five or more species in the Hawaiian Islands. The majority are indigenous to the fauna and only four native species have, so far, become pests in the cane fields. Of the introduced species, the army worm (*Cirphis unipuncta*) is undoubtedly the most serious enemy, particularly to fodder crops and to the young growing cane. The ravages of these insects are partially checked by the use of poisoned baits but their natural enemies are the most important controlling agents. The Indian Mynah is a bird that was introduced by the botanist Hillebrand about 60 years ago for the express purpose of reducing the numbers of these insects and it has done good service without becoming undesirably abundant. Severe outbreaks of both army worms and cutworms still continue and efforts have recently been made to ensure a greater degree of control. In 1923 H. T. Osborn sent over consignments of the Chalcid *Euplectrus platyhypenae* from Mexico, and by the following year nearly 46,000 examples were bred and liberated in the Islands. It is, however, too early to know the extent to which the parasite has adequately established itself but it has been found wherever it has been searched for in the Hawaiian Islands. The breeding and liberation of the insect are still being carried out.

(*To be continued.*)

THE ROOTS OF SUGAR-CANES.

Their Distribution in Soil.

DR. ATHERTON LEE has published in the new American Journal, *Plant Physiology* (Vol. I, No. 4, p. 363), a most interesting account of his work in the Hawaiian Islands on the distribution of sugar-cane roots in soil. The investigation was quantitative, and its results are thus of great value to those who wish to make comparative trials in other sugar-growing regions, or with crop-plants other than the sugar-cane.

(1) Method.

The method evolved is an ingenious yet simple field method. It consists in collecting and weighing the roots present in consecutive soil strata each of thickness eight inches. Five representative stools of cane are selected, and the stems are cut down level with the soil surface. Stakes and boards are erected so as to enclose the area occupied by the plants. Excavations are then commenced within the rectangular space. The soil of the first eight inches is removed by a spade, and thrown on to a one-quarter-inch-mesh sieve. Care is taken to cut the soil as close to the stools as possible, so that it contains all the roots that occupy the first eight inches depth of soil. The roots separated by screening through the sieve, are washed, dried and weighed. The next eight-inch layer of soil and roots is similarly excavated, and its root content determined by screening and weighing. The process is repeated for each eight-inch stratum, down to the forty-inches level. By these means precise numerical data are recorded.

(2) Some results obtained. (Summarized.)

Expt. I.—Plant-canes, H 109, 10½ months old, growing in furrows. Irrigated and manured soil (soil-type not stated).

1st 8-inches—	135.2	gr. roots,	70.1%	of total weight
2nd do.	43.9	do.	22.8	do.
3rd do.	11.3	do.	5.9	do.
4th do.	2.3	do.	1.2	do.

Most roots were found in the top eight inches of soil, and only a few had penetrated below the twenty-four-inch level.

Expt. II.—Plant-canes, Yellow Tip variety, 26 months old, manured but not irrigated; growing in furrows. Comparison between root-systems in two fields where crops were 35 tons per acre and 75 tons per acre respectively.

	Crop 35 tons.	*Crop 75 tons.*
1st 8-inches	70 %	73 %
2nd do.	19	18
3rd do.	8	7
4th do.	3	2

The root distribution resembles that in the first experiment, and is very similar for the two crops, in spite of their different magnitudes.

Expt. III.—Plant-canes, Yellow Tip variety, 7 months old, *versus* Badilla plant-canes, 11 months old, growing in furrows in each case.

	7-months Yellow Tip.	*11-months Badilla.*
1st 8-inches	75 %	69 %
2nd do.	17	19
3rd do.	8	12

The younger canes have more roots in the surface layer than the older canes, but the difference may in part be due to specific differences between the two varieties.

Expt. IV.—Plant-canes, H 109, 16 months old, in heavy adobe soil, *versus* plant-canes, H 109, 11½ months old, in loose sandy loam, each irrigated, and growing in furrows.

	Heavy soil.	*Loose sandy soil.*
Hilled-up soil between furrows	— %	4 %
1st 8-inches	75½	55
2nd do.	19	23
3rd do.	5½	9
4th do.	—	5
5th do.	—	4

These results indicate that the sugar-cane is more deeply rooted in sandy soil than in compact clay soil.

Expt. V.—Second ratoons, H 109, 21 months old, in loose alluvial silt, *versus* plant-canes, H 109, 22 months old, in semi-adobe soil, each irrigated and manured, and growing in furrows.

	2nd rats. alluvial soil.	*Plants semi-adobe soil.*
Hilled-up soil between furrows	2 %	5½ %
1st 2 inches	18	27
2nd 6 do.	42	53
2nd 8 do.	23½	11
3rd 8 do.	9	2½
4th 8 do.	4½	1
5th 8 do.	1	—

The ratoons in the lighter soil have a notably greater proportion of roots in the lower levels than the plants in the heavy soil, yet, even in the light soil, 62% of the roots are above the 8-inch level.

Expt. VI.—Plant-canes, Lahaina, 3 months old, *versus* plant-canes, H 109, 3 months old, under similar environmental conditions, and growing in furrows in each case.

	Lahaina plants.	*H 109 plants.*
1st 8 inches	88 %	88½ %
2nd do.	11	10
3rd do.	1	1½

The respective weights show that the H 109 canes had produced a much greater quantity of roots than the Lahaina plants (31 gr. against 15.4 gr. weight), but the percentage distribution in the soil layers is almost identical in each case. The roots of Lahaina canes are more susceptible to injury by root-fungi than roots of H 109 canes; this may account for the differences recorded.

Expt. VII.—Ratoon-canes, Lahaina, 16 months old, *versus* ratoon-canes, H 109, 15 months old, under similar environmental conditions, each growing *on ridges* and not in furrows.

		Lahaina ratoons.	*H 109 ratoons.*
1st	8 inches	19 %	13 %
2nd	do.	43	47
3rd	do.	23½	25½
4th	do.	11	11½
5th	do.	3½	3

The respective root weights (371 gr. and 374.5 gr.) indicate that little difference exists between root production in the *ratoon* stages of these two cane varieties, nor is root distribution in the ratoons much different.

The results for *ridged* cane rows are markedly different from those for *furrowed* rows. Whereas for furrowed canes the largest proportion of roots occur in the first 8 inches, for ridged-up canes, the largest proportion of roots occur in the second 8 inches.

Expt. VIII. Plant-canes, D 1135, 12 months old, *versus* plant-canes, H 109, 12 months old, growing under similar environmental conditions, in furrows, in loose sandy soil, not irrigated.

		D 1135.	*H 109.*
Hilled-up soil between furrows		10 %	3½ %
1st	8 inches	49	60
2nd	do.	18½	2½
3rd	do.	12	4
4th	do.	7	4½
5th	do.	3½	3½
Total weight of roots ..		183.6 gr.	121.4 gr.

The variety D 1135, is regarded as very resistant to drought. It is interesting to note, therefore, that the data show that D 1135 is deeper rooted, and that it produces a greater quantity of roots than H 109 when grown under similar conditions.

(4) Conclusions.

Whilst it is unfortunate that the results obtained are not in every case comparable, the data appear to warrant the following conclusions :—

1. The majority of the roots of sugar-cane grown in Hawaiian soils under Hawaiian conditions, occur in the uppermost levels of soil. In the case of canes grown *in furrows*, more than 58 % of the roots occur above the 8-inch level. In the case of canes grown *on ridges* (hilled-up canes), the largest proportion of roots occur between the 8-inch and the 16-inch levels, measured from the base of the stool. In either case, only 15 % or less of the roots occur below the 24-inch level.
2. Irrigation water will reach more roots in the case of canes grown in furrows than in the case of canes grown on ridges.
3. Cane varieties liable to root disease, or canes grown without irrigation, will obtain more root aeration if grown on ridges than if grown in furrows. The roots of canes suffering from lack of aeration seem to exhibit a black colour due to the absence of numerous secondary feeding-roots, and to the rotting of the cortex tissue, which leaves the stele uncovered. On the other hand, healthy, aerated roots exhibit a light-brown colour, are well supplied with feeding roots, and possess intact cortex tissue.
4. Deep tillage preparatory to planting, and the incorporation of organic matter into the deeper soil strata, should encourage aeration, should stimulate the formation of secondary feeding-roots, and should minimize root-rots.
5. Calculations from weights recorded in these studies indicate that between 0.9 and 1.85 ton of dry organic matter is left as cane-roots in the soil by a crop of some 8,500 stools of cane per acre, grown under irrigation in Hawaii.

There is no need to stress the importance of these studies to the sugar-cane planter in every cane-growing country. The method evolved by Dr. H. Atherton Lee would appear to be generally applicable. Difficulties, of course, might be experienced in its application to some kinds of soils, and in certain seasons of the year, but the method ought to yield valuable comparative results which should render more precise the cultivation of the sugar-cane in particular relation to soil and to climatic conditions.

F. HARDY.

INDIAN TEA STATISTICS 1925.

WE learn from "Indian Tea Statistics of 1925," published as a supplement to *The Indian Trade Journal* that the total area under tea in 1925 was 728,800 acres, nearly 2 per cent. larger than in the preceding year. 82 per cent. of the total area under tea lies in Assam where 930 plantations are reported to have a total area of 416,500 acres. The total production was 363,507,000 lb. a decrease on 1924 of 11,749,000 lbs. The average production per acre varies greatly from 668 lb. per acre in Lakhimpur (Assam) to 32 lb. in Hazaribagh (Bihar and Orissa), the average production for the whole of the year being 529 lb. as against 551 lb. in 1924.

Of the tea exported by sea, 280 million lb. went into the United Kingdom, 4 million lb. to Europe excluding the United Kingdom, 6 million lb. to Africa, 15 million lb. to America, 15 million lb. to Asia and 6 million lb. to Australasia.

During the last thirty years the exports from India increased by 124 per cent. and those from Ceylon by 91 per cent., but the exports from China declined by 54 per cent. Java's exports compares with those in 1905-06 have increased by 269 per cent.

Of the imports into the United Kingdom 18 million lb. were re-exported to the Irish Free State, 6 million lb. to Russia, 9 million lb. to the rest of Europe, 8 million lb. to the United States, 5 million lb. to Canada and Newfoundland and 3 million lb. to other countries.

ANISE-SCENTED OIL OF BAY.

By F. H. S. WARNEFORD, M.A., B.SC., A.I.C.
Assistant Government Chemist, Leeward Islands Laboratory, Antigua, B.W.I.

THREE varieties of the bay tree have long been recognised, namely, *Pimenta acris*, or Bois d'Inde, *Pimenta acris*, var. *citrifolia* or Bois d'Inde; Citronelle, or Lemoncilla; Bois d'Inde Anise, or the Anise-scented bay.

Only the true bay—*Pimenta acris*—is used in the bay industry. The oils distilled from the leaves of the other varieties possess a lemon and an aniseed-like odour respectively.

The composition of bay-oil from *Pimenta acris* has been determined by Mittmann, and by Power and Kleber. The constituents identified by them, arranged according to the amounts present, are :—eugenol, myrcene, chavicol, methyl eugenol, methyl chavicol, phellandrene and citral, the first three together forming about 90% of the whole.

Lemon-scented oil of bay has been examined by Watts and Tempany (1) who found 44% citral and 10% total phenols present in it.

No analysis of anise-scented bay-oil appears to have been published.

Recently, the writer has examined an abnormal bay-oil from Dominica, which was characterised by low phenol content, faint anise odour mingled with the ordinary bay aroma, and unusually high yield, these characteristics being true of all the bay-oil produced from bay trees growing in certain districts of that island.

Unfortunately, the sample examined had been stored for some time in a rusty, tinned-iron container. It was cleaned by washing with dilute hydrochloric acid, but, although the oil so purified served for the identification of the main constituents, the results obtained were not as satisfactory as would have been the case if freshly distilled oil had been available, since myrcene (one compound present), is known to polymerise on keeping.

The specific gravity of the purified oil was 0.958, and the phenol content, approximately 25%. Difficulty was experienced in the phenol determination, as portion of the non-phenols, dissolved in the alkali phenolates, were thrown out of solution on dilution, the resulting emulsion separating only very slowly. Thus, on treatment with 5% sodium hydroxide solution, 64% remained undissolved (Fraction A). On dilution of the phenolates, a heavy oil, equivalent to about 10% of the original oil, slowly separated (Fraction B), and, on acidification of the diluted phenolates, phenols, equivalent to 25% of the original oil, were recovered.

Fraction A was distilled at 40-45 mm. pressure. The fractions noted in the table were collected.

Fraction 1 possessed the characteristic odour of myrcene. After redistillation *in vacuo*, a colourless oil was obtained, with specific gravity 0.807 at 15°, refractive index 1.4616 at 19°, and boiling point 166°-168° at atmospheric pressure. (*Myrcene*, Specific gravity 0.801 at 15°, Refractive Index 1.470 at 19°, and boiling point 167°.)

		Degrees centigrade.	Per cent.	
Fraction	1	90–100	32	chiefly myrcene
,,	2	100–110	3	
,,	3	110–120	2·5	
,,	4	120–130	10·0	
,,	5	130–140	22·5	chiefly estragol
,,	6	140–150	3·0	
,,	7	150–160	2·0	
,,	8	160–170	20·0	chiefly methyl eugenol
Residue		—	5·0	

Fraction 5 possessed a faint aniseed-like smell. After refractionation, the greater portion boiled at 212°-220° at 760 mm., and had, at 15°, specific gravity 0.975, and refractive index 1.516. (*Estragol*, boiling point 215°-216°, specific gravity at 15°, 0.972, and refractive index at 15°, 1.522.)

The presence of estragol was confirmed by oxidation with ice-cold potassium permanganate and acetic acid (2), tablets, melting at 84°-85°C. being obtained after crystallising the oxidation product from alcohol and then from hot water. (*Homo-anisic acid*, M.P. 85°-86°.)

Anisic acid (M.P. 182°-183°) was also prepared from this fraction, by conversion of the estragol into anethol by heating with alcoholic potash(3), and subsequent oxidation of the crude anethol.

Fraction 8 had specific gravity 1.033 at 15°, and refractive index 1.527 at 15°, and the bulk boiled at 245°-250° (*Methyl eugenol*, specific gravity, 1.042; refractive index, 1.538; and boiling point, 248°).

The presence of methyl eugenol was confirmed by oxidation with aqueous potassium permanganate, to veratric acid M.P. 178°-179° (pure *veratric acid*, 179°-180°), and by preparation of the bromo-derivative, M.P. 77°-78° (*Mono-brom-eugenol dibromide*, M.P. 79°-80°).

Fraction B was distilled at 40 mm. pressure; 60% distilled over at temperatures from 90°-180°, and appeared to resemble Fraction A. The residual 40% was a tar.

The phenolic portion of the oil was distilled at 40 mm. pressure, and yielded 65% of pale-yellow distillate, of specific gravity 1.050 at 158, and refractive index 1.540 at 15°. The distillate boiled at 235°-250°C., and possessed a clove-like odour. It was not further investigated, but, as is the case with ordinary bay-oil it is probably a mixture of chavicol (boiling point 237°) and eugenol (boiling point 252°). The residue in the distilling flask set to a stiff tar.

Hence anise-scented bay-oil, which possesses an agreeable odour, differs from ordinary bay-oil chiefly in its low content of eugenol, and in the presence of comparatively large quantities of estragol and methyl eugenol, approximating to 15 and 13% respectively.

REFERENCES.

1. *West Indian Bulletin* IX, p. 275.
2 and 3. *The Chemistry of Essential Oils and Artificial Perfumes*, Parry, p. 238.
4. *The Chemistry of Essential Oils and Artificial Perfumes*, Parry, p. 243.

SYNTHETIC PEN MANURE.

Use of Distillery Sludge.

BY VICTOR M. HINCHY, M.SC., A.I.C.

(*Chemist, Caroni Sugar Estates, Trinidad.*)

THE value of pen manure on a sugar estate is too well known to form a subject for dissertation here, and the necessity for finding adequate means of making up existing soil deficiencies is also generally recognised.

While the compound ADCO would seem to go far towards supplying this need, its initial cost is comparatively high, and a cheaper substitute would be welcomed. It occurred to the writer that the sludge residues in the wash vats at Caroni Rum Distillery, Trinidad, might be experimented with to this end. Accordingly, in January, 1926, a trial was made on a small scale with this sludge and cane-trash. The results were such as to encourage further experiments, so during the dry season of 1926, heaps of trash were made in the fields and treated with sludge. Open cattle pens, in which the animals had been kept for about six weeks, were also treated, and a small experimental heap was made, using fresh megass sprinkled with lime as raw material.

Some of the heaps were turned over and mixed when the rain came, and a fresh application of sludge was given. These latter gave the best results according to chemical analysis, though there was some doubt among the planters as to whether the soft black mould resulting was the best for the heavy clay soils to which it was applied.

The open cattle pens when broken up for application to the fields, were considered infinitely superior to those of previous years when no sludge had been used.

A rapid fermentation with appreciable rise in temperature took place in the case of the fresh megass, and a fine black manure resulted, though it was noted that some stale megass similarly treated was affected by the sludge to a comparatively small degree.

A trial was next made of the action of distillery sludge and of ADCO mixture on cane-trash and on bamboo-grass.

In passing, it might be mentioned that the powdered ADCO was applied in a manner rather different from that recommended in the pamphlet published by the manufacturers. Instead of the compound being sprinkled over the raw material in thick layers one foot apart, it was mixed in a bucket with water in small quantities at a time, and distributed over the heap directly each load of material was spread. In this way, a more intimate and homogeneous mixture was obtained, and losses due to the caking of the ADCO, and to the light powder rising in the wind, were eliminated.

Late in the year 1926, the relative effects of distillery sludge on long and on chopped bamboo-grass were tested. The chopped grass seemed to rot down faster, and it was noticed that, whereas some of the long grass on the top of the heap had sprouted again, the short grass was completely dead. This is an important point in the opinion of the planter, and in itself suggests that it is advisable to chop the material if such as bamboo or para-grass be used.

Some samples of the manures were sent to the Imperial College of Tropical Agriculture for analysis, and Professor F. Hardy was kind enough to forward these results. The analyses were performed by Mr. G. Rodriguez, Analyst at the College.

Distillery Sludge Manures, Caroni Estate, Trinidad.

Field No.	Raw Material	Date of Sampling	Fresh Material				Oven Dry Material				Degree of Humification *	
			Moisture	Organic Matter	Ash	Total Nitrogen	Moisture	Organic Matter	Ash	Total Nitrogen	Apparent	Actual
			%	%	%	%		%	%	%	%	%
F 122	Trash & Cane tops	16/12/26	77.55	13.31	9.20	0.37	—	59.02	40.98	1.64	33.36	?
W 24	Trash ..	8/ 1/27	79.84	11.54	8.62	0.44	—	57.24	42.76	2.16	48.48	29.22
F 168	Bamboo-Grass ..	4/ 2/27	77.50	11.45	11.05	0.63	—	50.89	49.11	2.79	65.29	25.31
F 168	Do. (Full length)	25/ 3/27	78.42	12.17	9.41	0.45	—	56.38	43.62	2.07	53.67	13.69
F 168	Do. (Chopped)	25/ 3/27	77.69	14.24	8.08	0.75	—	63.83	36.17	3.37	50.05	10.07

* Hydrogen peroxide method.

These results should be compared with the analytical data for pen-manure and for ADCO manure published in the *Proceedings of the Froghopper Committee*, Part VII, 1927, by F. Hardy and G. Rodriguez.

It would seem that the use of distillery sludge in the making of synthetic pen-manure is well worthy of trial on a commercial scale, and there seems little reason to suspect that the field results would fail to justify the chemical analyses. Field experiments are now in progress, and will be described in a later article.

Finally, of no small importance is the fact that the diverting of the sludge from the factory skimmings drain has done much to remove a very decided nuisance and danger to public health.

TROPICAL WORLD NOTES.

St. Lucia.

The town of Castries, St. Lucia, was visited by a disastrous fire on 14th May The fire started about midnight of the 14th and continued until well into the forenoon of the following day. From its place of origin on business premises at the Eastern side of the town the conflagration swept through to the water front on the west. The burned area included the principal business section of the town including some of the largest business blocks, many small shops and many residences mostly of the better class of houses.

The fire covered a strip two blocks wide and in this strip only three buildings were saved; Barclays Bank (Colonial and Overseas) and two other business blocks. The Royal Bank of Canada building was lost but the contents were saved. It is understood that the loss, estimated at £250,000, was only partly covered by insurance. There was a loss of only one life and it was fortunate that while many of the retail shops were burned, large warehouses in which food-stuffs were held escaped, and these stocks, together with the fruit and vegetables produced in the island, averted the hunger difficulty which might easily have resulted after such a serious fire. The housing of the homeless also presented little real difficulty. On the first night Sunday, a good many people were put up at the police station, but the large barracks on the Morne and the unoccupied buildings at the *Vigie* were not called into use as friends and relations were able to accommodate those who had been burned out. A fire such as this is a great calamity by itself but St. Lucia has suffered seriously in other directions. Earlier in the year the Withertip disease of limes was discovered in that island, and at about the same time it was learned that the Panama Company, which had made very good start towards the establishment of what promised to be a profitable industry, had suspended operations. Each of these events is a very serious matter and the three together coming at a time when the finances of the island are already at a loss is almost calamitous.

It is to be hoped, however, that with the energy and application that the inhabitants of St. Lucia possess in common with those of other West Indian Islands, the Colony will recover from the effects of these misfortunes and develop again to a condition of prosperity.

* * *

French West Africa.

With an area of some 3,800,000 square kilometres of more or less arid territory in French West Africa, where, experts assert, sisal can be grown, a movement is afoot in several colonial sections of French West Africa to cultivate sisal on a large scale. Experts in the matter point out that France annually pays England and the United States more than 80,000,000 francs for cordage, strings, &c., and that even before the war Togoland was already growing and furnishing sisal to Germany. —(*The African World*, Vol. XCVIII, p. 481.)

Brazil.

Coffee production, price, and marketing conditions in Brazil are rather comprehensively treated by Nortz and Company, New York brokers, in an analysis in which they refer to rising cultivation and labour costs, decreased output per tree, and their belief that the planters could not long withstand lower prices. There are one or two things to bear in mind in regard to further events in the coffee market. One is the constantly declining production power of the older coffee estates, not alone in Brazil, but also in all coffee producing centres. It is reflected by the fact that nowadays twice as many coffee trees are needed to produce in Brazil the same amount of coffee as formerly. The second point is the rising cost of labour everywhere in tropical and more especially in coffee-growing countries. In Colombia, and in Central America generally, conditions are rapidly changing, through the opening of new means of communication, the building of railroads and industry, bringing the latter into touch with the ideas of the outer world as to wages and living standards. The result is a constant rise of salaries and higher cost of production. Finally, there is the evident deterioration of Brazilian coffee and the constantly increasing proportion of what the *Brazilian Review* calls hard coffee of a bitter and unpleasant taste, similar to Rio type. This will prove a growing handicap in the placing of Sao Paulo crops. The main question now uppermost in the trade is how Brazil next season will bear up under the brunt of the expected large crops everywhere, and what will be the influence upon the average output during the next years of the large new planting that has taken place as a result of Brazilian protective coffee policies. The only fact that we can consider as positive is that a large proportion of the Brazilian planters will not be able to stand the effect of lower coffee prices for any length of time.

* * *

Kenya.

There is every reason to think that the hope that Kenya Colony can supply itself and its neighbours with wheat is realizable, states Sir Rowland Biffen, Professor of Agricultural Botany at Cambridge University, who has been investigating wheat growing in the colony. He mentions the possibility of two crops per annum. The Kenya Farmers' Association recently shipped 3,500 tons of maize to England, one of the largest consignments ever despatched. It is hoped that by the end of February a total of 20,000 tons of Kenya maize will have been shipped. The agricultural census of Kenya for 1926 gives evidence of the continued development of the colony. It states that there are 200 additional occupiers of land, bringing the total to 1,800. Of 4,500,000 acres alienated to Europeans, 460,000 are being cultivated, maize representing 41 per cent. coffee and sisal each 14 per cent. and wheat 9 per cent.—(*The Empire Mail*, Vol. XVI, p. 181.)

AGRICULTURAL DEPARTMENTS.

Chief Agricultural Officers.

THE following list has been compiled from information supplied by various Agricultural Departments at the request of the Colonial Office. Unfortunately the list is not quite complete owing to the fact that information has not yet been received from several Departments. A similar list will be published yearly and notes of transfers will be made from time to time.

ANTIGUA	*Agricultural Superintendent*	A. W. GALLWEY (Acting).
BARBADOS	*Director of Science and Agriculture*	J. P. D'ALBUQUERQUE, M.A. (Cantab.), F.I.C., F.C.S. (Lond.).
CEYLON	*Director of Agriculture*	HON. F. A. STOCKDALE, C.B.E., M.A., F.L.S.
DOMINICA	*Agricultural Supt. and Curator*	F. G. HARCOURT.
FIJI	*Superintendent of Agriculture*	J. D. TOTHILL, D.SC.
GAMBIA	*Director of Agriculture*	A. J. BROOKS, F.L.S., F.C.S.
GOLD COAST	*Director of Agriculture*	C. H. KNOWLES, B.SC. (Lond.).
HONG KONG	*Superintendent of Agriculture*	H. GREEN.
JOHORE	*Acting Inspector of Agriculture*	F. DE LA MARE NORRIS, B.SC.
KEDAH	*Agricultural Officer*	CHE MD. NOOR BIN HAMZAH.
KENYA	*Director of Agriculture*	ALEX HOLM, C.B.E., F.H.A.S., M.R.A.S.E., S.E.A.C. (Dip. Hons.),
LEEWARD ISLANDS	*Govt. Chemist, and Supt. of Agriculture*	A. E. COLLENS, F.I.C., F.C.S.
MAURITIUS	*Director of Agriculture*	H. A. TEMPANY, D.SC. (Lond.), F.I.C., F.C.S.
MONTSERRAT	*Curator of Botanic Gardens*	C. A. GOMES.
NIGERIA	*Director of Agriculture*	O. T. FAULKNER, B.A.
NORTHERN RHODESIA	*Acting Secretary for Agriculture*	J. SMITH.
NYASALAND	*Director of Agriculture*	E. J. WORTLEY, O.B.E.
PALESTINE	*Director of Agriculture*	E. R. SAWYER.
ST. KITTS-NEVIS	*Agricultural Superintendent*	R. E. KELSICK.
ST. LUCIA	*Agricultural Superintendent*	E. A. WALTERS, F.R.H.S., F.R.Met.S,
ST. VINCENT	*Agricultural Superintendent*	T. P. JACKSON.
SEYCHELLES	*Director of Agriculture*	P. R. DUPONT.
SIERRA-LEONE	*Director of Agriculture*	D. W. SCOTLAND, F.S.I., N.D.A., N.D.D., H.A.A.C. (Dip.).
SOMALILAND	*Director of Agriculture and Geologist*	R. H. FARQUHARSON, M.A., M.SC., F.G.S.
STRAITS SETTLEMENTS AND FEDERATED MALAY STATES.	*Secretary for Agriculture*	A. S. HAYNES.
TANGANYIKA TERRITORY	*Director of Agriculture*	A. H. KIRBY.
TRINIDAD, TOBAGO AND GRENADA	*Director of Agriculture*	HON. W. G. FREEMAN, B.SC. (Lond.), A.R.C.S., F.L.S.
UGANDA	*Director of Agriculture*	S. SIMPSON, C.M.G., B.SC. (Edin.), M.R.A.S.E.
VIRGIN ISLANDS	*Curator, Botanic Gardens*	T. FORBES.
ZANZIBAR	*Director of Agriculture and Govt. Chemist*	V. H. KIRKHAM, B.SC., F.I.C., Dip. Agric. (Cantab.).

ELECTRIC WELDING.

Its Use in the Sugar factory.

BY G. T. PEARSON.
Welding Engineer, Ste. Madeleine Sugar Company, Limited, Trinidad.

ALTHOUGH the introduction of Electric Arc Welding into the Ste. Madeleine Co's factory at Trinidad several months ago was not the creation of a precedent in the Sugar Industry of the world, it was at least an innovation looked forward to with interest by the Company concerned.

These few notes on our experience to date are contributed with the object of outlining the multifarious uses to which our welding apparatus has been put since its installation. Firstly, a short description of the combination which produces the arc may not be out of place.

Within the last few years apparatus for arc welding has been highly perfected. Ours consists of a 16 H.P. motor coupled on single bedplate to a generator capable of delivering 250 amperes of current, complete with a long length of drum wound supply cable for connection to the Factory supply of 220 volts D.C. The whole, including the switchboard panel, stabilizers, &c., is mounted on four rubber tyred wheels and can be manhandled on flat surfaces with ease, an important factor in cases of breakdown and emergency.

To those unfamiliar with welding processes it may be stated that the electric arc has no mysterious quality which makes it especially adapted for welding purposes. It is, however, the most efficient means known for the production of welding heat at the lowest cost and is the most convenient to apply in the uniting of steel, iron, and various alloys of these metals.

Briefly, electric arc welding is carried out in the following manner:—One pole of the welding generator is attached to the metal which is to be treated, while the other pole is connected to the operator's holder. Into the latter is placed the welding wire, usually termed the Electrode. The current arcs from the electrode to the metal to be welded, or *vice versa*. In doing so, an intense heat is generated at the immediate point under the electrode causing both steel and electrode tip to melt at a uniform temperature, rapidly cooling to form a weld.

Locomotive Repairs.

When welding work commenced in September last our first essay was made into the Locomotive Shop where some dozen or so engines were undergoing the usual out-of-crop repair.

Those familiar with the type of labour engaged in the hauling of cane during crop season, over track laid on far from ideal sub-soil need no assurance that our engines receive a pretty rough gruelling and the matter of reclaiming broken and worn parts of engines and rolling stock had become one of great importance to this company.

A commencement was made on the treatment of some badly cracked side frames which in certain cases would have been impossible to patch. The astonishing utility and economy of the arc welding process became apparent immediately, these cracks being united with good sound metal in an incredibly short space of time.

Then followed the adding of metal to oversize valve and piston crosshead pin holes and pins, these afterwards being machined to a standard size for every engine. Worn keyways of various depths in all parts of an engine where keys are driven, were built back to their original depth and keys of correct proportional dimension fitted.

Leaking and defective Steam and Water pipe systems were welded at every joint and in many instances redesigned to take a shorter path with an entire elimination of joint, elbow, tee and angle pieces, pipes being cut and welded in position. The worn faces of Cast Iron Axle Boxes were treated by placing steel sheets equivalent to the amount of wear, in position, and welding around the edges—the boxes then being completed by filing or grinding the faces until a perfect fit was obtained.

Two further undertakings representing the saving of a large sum of money in themselves are worth recording. On one locomotive, the removal of a Retainer Valve Casting from the boiler side disclosed, that rust had eaten into the plate to an alarming extent, leaving only $\frac{1}{16}$th of an inch of metal underneath. This surface was built upon, and layers of metal added over the corroded area until a thickness of $\frac{3}{8}$ths of an inch was reached, through which new holes were drilled and threaded to hold the Casting in place. It is no exaggeration to say that without welding, this boiler must very shortly have ended its career of usefulness.

In the other instance, a new copper fire-box had been received from the manufacturers, but on attempting to fit it into an existing $2\frac{1}{2}$ inches thick steel foundation ring it was found to be undersize. Pieces of $\frac{1}{2}$ inch plate were thereupon cut and welded on to the inner faces of the ring and the fire-box fitted into it without any disturbance of the foundation ring holes. On the fire-box being placed in the boiler, further trouble was encountered due to the manhole rings not lining up, the fire-box ring being some 2 inches lower than that in the boiler plate. Pieces of correct thickness of plate were welded to the top of the boiler ring and the ring bottom cut until correct alignment was obtained. The 2-inch thick manhole stiffening ring then being found too small, it became necessary to cut this through centres to extend, the extension gaps being filled up with weld metal quite easily and successfully.

The total cost of welding on these two undertakings did not exceed 55 dollars. Since in the first instance it is difficult to imagine how any other application but welding could have solved the problem, and in the second, nothing but the scrapping of a costly foundation ring and erection of a new boiler front could have met the case, no comparative cost can be estimated.

Due to urgency of work in other departments on the approach of crop season, eleven weeks only were spent in Locomotive repair and reclamation. It is not unreasonable to assume that the work carried out in this short period has considerably contributed to the efficiency of our transport during this present crop. Since cane hauling commenced, numerous minor breakdowns and collision cases have been dealt with quickly and expeditiously, enabling us to get locomotives back on the track with a consequent saving of time and money.

Cast Iron Welding.

In the business of Sugar planting and manufacture an astonishing diversity of mechanical equipment is employed, a fairly large proportion of which is manufactured from Cast Iron parts. Lest anyone fall into the error of imagining that Arc welding is the cure for all machinery defects, it is necessary to mention that approximately only 40 per cent. of Cast Iron welds are successfully carried out.

The difficulty encountered in welding cast iron arises from expansion and contraction of the local area heated by the arc, often causing new fractures, and the tendency of the weld to become hard and brittle when the casting has cooled, due to absorption of a large amount of free carbon from the casting.

With facilities for preheating in a properly constructed furnace and slow annealing after carrying out the weld, the above mentioned proportion of successes could be considerably increased, but as yet, we have not made provision for this correct method of treatment.

In certain cases too, the Electric Arc is not nearly as adaptable as the Oxy-Acetylene flame—the spreading heat from the latter enabling the Welding Engineer to distribute the heat expansion stress over a much larger zone, thus keeping the casting at a weldable heat.

General Repairs.

Before the commencement of crop, eight weeks were left in which to tackle waiting work in the Factory, and parts constantly arriving from our Agricultural department.

From the host of jobs undertaken may be mentioned :—

Construction of new pipe lengths and branches for Water cooling tower to replace damage in transit from England.

Treatment of a badly fractured Mill bed from an outlying factory.

Numerous fractures in Tractor Cast Steel side frames.

Fractured Sugar Basket distance pieces.

Building up for re-machining Sugar basket Centrifugal shafts.

Filling up of wrongly drilled holes in various parts.

Building up of worn parts on Shaftings of all dimensions, such as Scraper Plate, Cane Chopper Knife, Cane Rake Shafts, &c.

Fractured Cane weigher scale beams.

Building up worn Derrick drum gear teeth.

Construction of all welded air cooling units for Power House Turbines.

Building up of worn keyways in Mill Engine Flywheels, Motor Armature shafts, Scraper Plate Shafts.

Welding of new extension pieces on old Roller Scraper plates.

Fractured Tractor motor cases.

Sealing of Flanges and Joints in considerable lengths of Steam and Water piping, &c.

This list is chosen at random from records and does not represent one-tenth of the range covered. It may be mentioned that due to pressure of time many repairs were executed hastily, short cuts being taken in preparation and cleansing before treatment. Despite this, the pleasing proportion of 95 *per cent. of all welds undertaken have been successful in service.*

During the busy season of crop, with mills grinding twenty-four hours a day, locomotives hauling cane as fast as it can be delivered to the scales, tractors, ploughs, and other field equipment working at top speed from sunrise to sunset, it is only to be expected that breakdowns will frequently occur on mechanical construction in one or other department of an organisation, and the Ste. Madeleine Co., is no exception to this general rule.

On innumerable occasions our Welding plant has been requisitioned to carry out a hasty repair and in most cases the repair has been successfully accomplished, enabling the department concerned to get into stride again in the shortest possible time.

Unless properly acquainted however with the possibilities of welding, engineers are apt to fall into the habit of imagining that the "sticking a little bit" on to a job should produce a permanent and lasting repair. On the contrary, good welding can only be expected to follow careful preparation, and the total strength of say a $\frac{1}{2}$-inch plate can never be obtained unless the weld is carried out to the total thickness of the $\frac{1}{2}$-inch plate.

This is a fundamental fact that cannot be overlooked, and in extremely urgent circumstances where single fillets of weld have been laid to enable parts to hold out until next overhaul day, nothing more should be expected than strength equivalent to the thickness of the single fillet of weld.

Mention should be made here of a highly efficient portable Acetylene generator used in conjunction with our Welding plant. This is a generator of unique design, since the Carbide of Calcium used to produce the Acetylene gas is compressed into cakes—each cake producing a guaranteed gas yield. Together with Cylinder Oxygen, and the necessary cutting and welding torches provided with the outfit, we carry out all our metal cutting in thicknesses up to one inch plate and over if required. Welding by this Oxy-Acetylene process is extremely valuable in thin sheet plate, heat from the Electric Arc being usually too concentrated to weld on less than $\frac{3}{32}$-inch. With this apparatus we can cut to within $\frac{1}{32}$-inch of accuracy and it is constantly being employed in the cutting of crusher roller point plates, circular pipe flanges, locomotive

fire-box baffle plates, cane elevator plates, the opening of fractures in various structures for welding, the cutting of new trash plates, &c., &c.

This is a great time and money saver, since on straight work, sixty feet of ½-inch steel plate can be cut in an hour, while on demolition work approximately 120 rivets per hour can be cleared from a structure. When one imagines the amount of labour that would be required to accomplish this task in the same time by old methods the great saving becomes immediately apparent. This generator has paid for itself over and over again.

Our equipment is complete only with a small portable grinder with which many of our jobs are prepared and finished, very often eliminating slow and laborious machine shop work. Especially valuable is this in the finishing of those Cast Iron welds which have been persuaded to remain whole, but are too hard for the machine tool. The stones used in conjunction with this grinder are renewable, and we use various grades and sizes according to the requirements of the metal under treatment.

Constructional Work.

So far, we have carried out very little constructional work, our attention having been directed almost constantly to repairs and salvage, and yet it is in the fabrication of new parts from sheet steel that the greatest savings can be effected.

Considerable investigations of the subject of welding instead of rivetting and bolting has been made by Lloyds Register of Shipping. As the result of many exhaustive tests it was determined that the tensile strength of welded joints was from 90 to 95 per cent. of the original plates as against a strength of from 65 to 70 per cent. in riveted joints—*a difference of 25 per cent. increased strength in favour of the welded joint.*

It has been calculated that a saving of 25 to 30 per cent. can be made on any structure if arc welding is carried out in preference to rivetting or bolting. In cases of structures where bolting is used to enable dismantling to be effected at will it should be remembered that wherever there is an Oxy-Acetylene blowpipe, a structure can be dismantled in considerably less time than the loosening of bolts would take.

We feel that we have barely touched the fringe of possibilities with our Welding apparatus. Yet it is not too much to expect that, apart from visual savings on repair, and in the future, construction, we shall be able to reduce the amount of stock parts hitherto essential to the comfortable running of our different departments.

Finally, we would here state that welding is an application of metallurgy and engineering, and its study should be so approached. Each job undertaken should be examined and treated on its individual merits, and where varieties of welding are met with, only a specialist—a thoroughly competent welding engineer—can obtain consistent and maximum results.

COLLEGE AMALGAMATED CLUBS.

THE final meeting of the College Amalgamated Clubs was held in the Students Common Room at 2.30 p.m. on Thursday, 2nd June, 1927.

The President—the Acting Principal—was in the chair and there was a large attendance of members, including staff and students.

(1) The Treasurer's report was read and confirmed, and showed a balance of $557.95 to be carried forward.

(2) The President addressed the meeting and expressed the thanks of himself and the staff towards the officers of the Club, and the successful manner in which they had managed the Club and games. He proposed a vote of thanks which was seconded by Professor Ballou.

(3) Election of officers—The President stated the necessity for electing officers to form a "Nucleus Committee" which could get the Club started next session. A Committee of five was formed including Dr. Briton-Jones and Mr. Croucher representing the staff; Mr. Birkett, Mr. Sheffield and Mr. McDonald representing the students.

(4) Mr. Symond's proposals of authorising two members to sign cheques for the Club during the vacation was adopted, and Dr. Briton-Jones and Mr. Croucher were authorised.

(5) It was decided that an inventory of all the material belonging to the Club should be made at the commencement and end of each session, and a proper storeroom be obtained in which the material may be stored under lock and key.

(6) The standing committee was authorised to obtain Rugby Football posts during the vacation at an approximate value of $15.

(7) Mr. Croucher was asked and agreed to arrange fixtures for the Association Football Club during the vacation in readiness for the next session.

The meeting was then declared adjourned by the President.

J. A. POTTER,
Hon. Sec., C.A.C.

Mr. J. R. Fisher who visited the College during his tour of the West Indies has written a series of interesting and entertaining articles "Impressions of the West Indies" for *The Northern Whig*. In the fourth article—"The fight with disease"—published on 18th May, he gives a concise and informed account of the Imperial College and an appreciation of its work.

In a letter to *The Morning Post* published 3rd May, Mr. Ruggles Gates, Professor of Botany in the University of London, wrote of the importance of the Imperial College of Tropical Agriculture, and the Amani Institute.

MYCOLOGICAL NOTES.

A mosaic resistant variety of cucumbers.—O. H. Elmer.

A variety of cucumbers named "Chinese Long" obtained from Professor R. H. Porter, of Nanking, China, in tests during the past year has proved highly resistant to the cucumber mosaic disease. Porter stated concerning it that "Last year I did not observe any (mosaic) in this locality—(nor)—thus far this season." Chinese Long cucumber is a slicing type not suitable for pickling.

Mosaic inoculation tests conducted in the greenhouse, where 50 plants each of the varieties Chinese Long and White Spine were inoculated, have to date resulted in no infection in Chinese Long and approximately 100 per cent. infection in White Spine. In a field plot consisting of five six-rod rows, aphids transferred from mosaic cantaloupe plants failed to induce infection.

* * *

Commercial tobaccos and cured leaf as sources of tobacco mosaic.—W. D. Valleau and E. M. Johnson.

Results of inoculation of a number of commercial brands of tobacco and air-cured leaf of different sources and ages indicate that these may be sources of the mosaic disease in tobacco. The disease has been produced by inoculations of tobacco from four brands of plug, three brands of cigarettes, and five brands of granulated smoking tobacco. Almost 100 per cent. infection has been produced from air-cured leaf as old as five years, both in field and greenhouse tests. Fields tests indicate that primary infection from the use of tobacco by workmen in the fields can be reduced to less than one-half of one per cent. (in one test to zero) by requiring the use of heat sterilized tobacco by the workmen while pulling plants from the bed and during transplanting in the field. Preliminary experiments indicate that the disease can be produced from dried tobacco as old as 18 to 30 years.

* * *

Bacterial Wilt of Bananas—S. F. Ashby.

MR. S. F. Ashby who was formerly Professor of Mycology and Bacteriology at the Imperial College of Tropical Agriculture has recently published another paper (*Kew Bulletin*, No. 1. 1927) on the Bacterial Wilt Disease of Bananas. The paper is illustrated by photographs which show the effect of inoculating tomato and tobacco plants with pure cultures of a bacterium isolated from banana varieties affected by a vascular wilt disease in Trinidad.

A previous paper on this disease was published by Mr. Ashby in *Tropical Agriculture*, June, 1926, in which an account was given of the symptoms, character of the bacterium and inoculation experiments. Alluding to the first account the author states "It was shown that the organism was evidently identical with a bacterium isolated by Rorer in 1910 from bananas affected in the same way, and successfully inoculated into several varieties. Rorer * suspected that it might be a strain of *Bacterium solanaceanum* E. F. S. He failed, however, to obtain infections on solanaceous plants in Trinidad, and E. F. Smith could not make it infect tomato plants at Washington. It's identity had, therefore, been in doubt for some fifteen years."

Mr. Ashby's account of the symptoms of wilt on inoculated tobacco and tomato plants, and of the cultural characters of the organism establish beyond doubt the identity of the pathogene causing bacterial wilt of Bananas as *Bacterium solanaceanum* E. F. S.

It is further stated that "Although a general infection of the whole plant can be effected by inoculation of the aerial parts, the field evidence, especially for solanaceous species, indicates that infection is normally from the soil into injured roots (the potato also by means of infected tubers). The recent occurrence of the disease on the Giant Fig banana in Trinidad was restricted to a plot on one plantation, although plantings from the same batch of suckers had been made at a number of other points in the Island; infection from the soil appeared, therefore, to be indicated, and was the more probable because the susceptible "Moko" plantain had been abandoned many years ago as a temporary shade for Cacao on this plantation owing to the disease. In 1911 Rorer recorded natural infection of the Chinese or Cavendish banana, in Trinidad, and inoculated it successfully with pure cultures of the bacterium; this variety is grown widely by the peasantry and appears now to be attacked rarely, but should the area in this variety be considerably extended there will be danger of spreading the disease in infected planting material."

The author acknowledges his indebtedness to the late Dr. C. L. Withycombe for the photographs.

H. R. BRITON-JONES.

* Rorer named the pathogene *Bacillus Musae*.

BRITISH ASSOCIATION.

SIR ARTHUR KEITH has been elected President of the British Association which will meet at Leeds during the period 31st August to 7th September. The sectional presidents will be: (*a*) (Mathematics and Physics), Prof. E. T. Whittaker; (*b*) (Chemistry), Dr. N. V. Sidgwick; (*c*) (Geology), Dr. H. H. Thomas; (*d*) (Zoology), Dr. G. P. Bidder; (*e*) (Geography), Dr. R. N. Rudmose Brown; (*f*) (Economics), Prof. D. H. Macgregor; (*g*) (Engineering), Sir J. B. Henderson; (*h*) (Anthropology), Prof. F. G. Parsons; (*i*) (Physiology), Dr. C. G. Douglas; (*k*) (Botany), Prof. F. E. Fritsch; (*l*) (Education), the Duchess of Atholl, M.P.; (*m*) (Agriculture), Mr. C. G. T. Morison.

SUGAR NOTES.

Compiled by the College Department of Sugar Technology.

Electro-Welding on Sugar Plantations.

A plant for electric welding, using Direct Current, has been in operation at the Usine Ste. Madeleine (Trinidad) for several months. It is estimated that this plant has already paid for itself several times over. The uses found for it are legion, it is merely a question of what work should have precedence.

In the factory many repairs have been effected by welding. The metal of worn out journals, gear-teeth, &c., has been built up again. On the railway rolling stock great savings have been effected by welding locomotive fire-boxes, broken truck-coupling links and many other parts which previously went to the scrap heap. From the fields broken, or worn-out, parts of agricultural implements are constantly received for welding.

Steel and Wrought Iron machinery parts are more easily welded than Cast Iron. The unreliability of certain Cast Iron Weldings is due to the contraction of the metal on cooling; and this varies with the composition of the metal. To have any chance of success in welding Cast Iron parts, the metal must be gradually heated before welding and cooled afterwards at the same rate. After watching the plant in operation, and the diversity of the work performed one wonders why, within certain limits, should spare parts ever be required. Such a plant certainly allows of a considerable reduction in the number of spares which it is usually considered advisable to carry in stock in a tropical sugar factory.

* * *

Centrifugal Clarification of Molasses.

Writing in *Facts About Sugar* (xxii, p. 506), Mr. E. W. Kopke discusses the results obtained by the use of a centrifugal separator at Central Espana, Cuba. Insoluble substances of a gummy viscous nature were removed from the molasses, resulting in—

(1) a better quality of commercial sugar.

(2) a better quality and freer drying final sugar.

(3) Higher boiling house recovery, due to uncontaminated crystals in the final massecuite.

(4) Increased capacity, due to freer boiling and drying and less scaling of the pan heating surfaces.

The efficiency of the machine is at present being investigated at this College and the results will be published in due course. The physical measurements which have so far been made of various samples of molasses before and after centrifugal clarification supply very direct evidence in favour of the process.

A valuable by-product of the Sugar-Cane.

Megass (or Bagasse) is rapidly coming to the front as a valuable by-product of the cane sugar industry. Factories with good heat economy and situated in localities where the cane averages over 12 per cent. fibre have a surplus of Megass over their fuel requirements. There is an increasing demand for this material for the manufacture of Insula ing boards ("Celotex"), explosives, artificial silk, &c. It appears probable that the paper industry will soon claim it as a source of pulp. A process for the production of paper pulp from Megass * has been recently developed by Dr. Nanji in England. The inventor claims to have overcome the difficulties hitherto encountered in producing a pulp from Megass suitable for the manufacture of the best grades of paper.

It is estimated that the yield of dry pulp will amount to 40 per cent. of the weight of air-dry Megass; and that its minimum market value would be from £16 to £20 per ton. Experts have expressed the opinion that this pulp would be suitable by itself for the manufacture of the best grades of paper; but that it would probably find its most important application as an addition to mechanical wood pulp for the production of newspaper. The new process has been patented in every sugar producing country.

* I. S. J. 1927, 85.

* * *

World's Sugar Production.

From the best information now available the world's sugar production for the current season, is estimated at 23,862,000 long tons as against 25,093,000 last year. The production in the British West Indies has fallen from 215,000 to 200,000 tons. While it is impossible to form an accurate estimate of world production in 1927-28 at this time, the reports of sowings and of crop conditions indicate that with normal growing conditions, the loss in production experienced this year will be made good in the crops of 1927-28. —(*Facts About Sugar*, Vol. XXII, p. 495.)

A CORRESPONDENT of the *South African Sugar Journal*, who recently commented on the backwardness of Cuba as regards the scientific cultivation of sugar-cane, expressed the opinion that it was largely due to a lack of any systematic study of technical publications and books on the subject. Unfortunately in some quarters text-books are still looked on as very much of a luxury, and when sugar is not produced remuneratively owing to competition or over-production, the demand for technical information (which one would have supposed was the more needed then to cope with the competition) tends to fall off.

The Editor will be pleased to send a gratuitous specimen copy of *Tropical Agriculture*, post free, to anyone interested in tropical development.

CHEMICAL NOTES.

Compiled by the College Department of Chemistry and Soil Science.

The Rate of Application of Lime to Soils.

That the immediate effect of a lime dressing on an acid soil depends to a greater extent on the mode and conditions of application than on the amount applied has long been realised, though concrete data on the subject have not been available. Experiments on widely differing types of soil have been conducted (*J. A. Slipher, Ind. and Eng. Chem.*, Vol. 15, p. 561) to determine the efficiency of successive fractional dressings of lime, and the variation in "crop response" and soil reaction with the quantity of lime added. With practically all crops tested the first application of lime gave a relatively greater increase in crop than succeeding equal dressings, and the increase in crop produced by the first liming was only equalled by the combined effect of the three following limings. Moreover, the low rates of liming produced a greater total increase in crop per unit amount of lime than the heavy rates. Parallel effects were obtained with the variation in "soil reaction" of the various soils.

It would therefore appear that it is more effective to apply light dressings of lime frequently rather than heavy dressings occasionally.

* * *

Manganese in the Soil.

Through the rôle of the element manganese in the soil fertility is still a matter of doubt it is generally accepted that the presence of a trace is beneficial, if not essential, to the growth of most plants. The element in all probability acts as an oxidising agent, influencing fertility through its effect on the chemical and biological process in the soil. Thus it stimulates the processes of nitrogen fixation, of ammonification and of nitrification. That it may also be an element essential to plant growth has been demonstrated, and a deficiency in a soil tends to cause chlorosis to develop in the crop.

The effect of adding manganese to a soil depends to a great extent on the reaction of the soil itself. For acid soils there appears to be an optimum manganese content, which if overstepped may produce toxic effects on the crop; but if the soil be already alkaline any addition of manganese will always tend to produce a beneficial effect.

Some striking experiments have been carried out (*Scheiner and Dawson, Ind. and Eng. Chem.* Vol. 19, No. 3) on tomato plants growing on a highly calcareous soil which would produce no satisfactory growth or yield, even after heavy application of a well balanced mineral fertiliser. Addition to the fertiliser of 20 to 25 parts per million of manganese sulphate produced a very marked increase in both growth and yield of the plants. Signs of chlorosis, apparent before the addition of the manganese, disappeared. Stable manure which contains a trace of the element produced the same beneficial result.

Experiments with sugar-cane are in progress (*Berenger and Nichols, Rev. agr. Maurice* 3 109-111 *and Haddon Rev. agr. Maurice* 3161-2), manganese sulphate being added to the regular fertilisers. Molasses alone used as a fertiliser increased the yield of sugar-cane, largely by its effect on the bacterial flora of the soil. It also contains a small percentage of manganese. An addition of 5.5 kg. of manganese sulphate per acre to the regular fertiliser increased the cane yield in a field test 21.8 per cent. but had no effect on the composition of the juice.

* * *

The Efficiency of some New Fertilisers.

Pot and field experiments have been carried out in order to test the efficiency of certain mixed artificial fertilisers by E. Blanck, F. Gieseke, and F. Scheffer (*Zeit. Pflanz. Düng*, 1927, *B*.6, 49-67.) Their effects on various crops were compared with the effects of similar more common fertilisers.

Thus "Leunaphos," prepared by mixing Ammonium sulphate and diammonium phosphate, proved equally efficient with other soluble nitrogenous and phosphatic fertilizers.

"Biophosphate" containing mineral phosphates and an estuarine alluvial clay containing a high proportion of silicic acid, proved considerably less efficient than ordinary phosphatic fertilizers.

"Schlick-Kalkstichstoff"—a similar preparation but containing nitrogen, also proved unsatisfactory.

"Asahi-Promoloid"—a colloidal silica preparation, showed some effect in pot experiments but none in field experiments.

* * *

Lime Burning.

In a paper on "Science and Engineering in Lime-Burning" (V. J. Azbe, I.E.C., 19, p. 600) is given a summary of the various improvements in the burning of lime from the old uneconomical methods and irregular products of twenty-five years ago to the scientific methods and standardised material produced at the present day. The scientifically produced material is now constant in rate of hydration, in plasticity, and in colour. A summary is given of the physical and chemical changes taking place when lime is burnt, together with a summary of the control requirements of a modern kiln. The latter include the use of raw material of uniform size, a regular, carefully controlled, well-mixed supply of producer gas and air, withdrawal of the product at regular intervals, and rapid and even removal of waste gases. The main object is to keep the kiln temperature uniform throughout in order to procure a uniform product, and to so operate the kiln that the waste gases contain a high percentage of carbon dioxide, a low percentage of oxygen and no carbon monoxide.

REVIEWS.

STEAM.—ITS GENERATION AND USE.—11th British Edition (Revised) of the valuable reference book issued by Babcock and Wilcox, Ltd. It contains references to the latest improvements in steam generation. The following subjects are fully dealt with in the text: Theory of steam making; Steam boilers, past and present; The Babcock and Wilcox boiler; the Utilization of waste heat; Steam plant and furnace efficiency; Combustion; classification of Coals; Superheaters, Economizers, Air Heaters and Water treatment; Mechanical Stokers; Chimneys and induced draft; Boiler tests; Working instructions for Boiler Stokers and Superheaters; General information for steam users. There are besides useful tables, and numerous illustrations of B. & W. boiler installations in different parts of the world.

This new edition will be welcomed, not only by actual users of B. & W. boilers, but also by Engineers and Students who will find therein much useful information of a practical nature in readily available form.

W. S.

* * *

NATION'S BUSINESS, Vol. XIV, No. 13. December, 1926, pp. 116.

This is one of the many boyishly exuberant business magazines popular in America and finding increasing favour in Europe. Foresight and efficiency are the ideals. The editor tells us that H. L. Doherty, who, "on a clear day . . . . can see ahead 25 years" . . . "is the man who, as a boy with $6 in his pocket, set out to become one of the country's leading public utilities men."

The paper has value which comes out in its calmer moments. Few writers realise that the business man wants to be an active user and not an intelligent critic of the banking system and as a result the normal book on banking is sincere, sound and unreal, even the well known and comfortable *Rae's Country Banker* is but a little removed from the usual. "Every man and his Bank VIII"—one of the features of *Nation's Business*—does give some idea of the relations between banker and business man.

A distinguished banker gives a quick and pleasing survey of the American economic position in an article with the title "It ain't gonna rain no more?" In his pauses between metaphor and simile, the writer thinks it necessary to ridicule the attempts of theorists to elucidate the fact of the trade cycle—mainly, one gathers, because he cannot understand their findings.

Almost all the articles are enlivened with cartoons which are forceful and show a pretty turn of humour. The journal should give the business man much pleasure and will give Mr. Mencken much Americana.

G.W.

BRITISH SLAVERY AND ITS ABOLITION, 1823-1838 by William Law Mathieson. Longmans, Green & Co., Ltd., London. pp. x, + 318. Price 16s.

To approach a question so completely undermined with prejudice as slavery requires more than ordinary courage and ability. Dr. Mathieson threads his way skilfully through the hysterical obstinacy of the planters and the fanatical vapourings of the abolitionists and presents us with an impartial survey of the system and the means adopted to abolish it in the British West Indies. His description of the sugar industry, and a comparison with foreign systems of slavery lends perspective to his thesis. Occasional descriptive errors are excusable in a book dealing so admirably with such a controversial subject.

C. Y. S.

BOOKS RECEIVED.

WE have to acknowledge the receipt of the following books:—

The Business Side of Agriculture. A. G. L. Rogers. *Methuen & Co.*, Price 5*s*.

Flora of West Tropical Africa. Vol. 1, Part 1. J. Hutchinson and J. Dalziel. Crown Agents for the Colonies. Price 8*s*. 6*d*.

The Agricultural Output of England and Wales for 1925. Ministry of Agriculture and Fisheries. H.M.S.O. Price 3*s*. 6*d*.

Report of the Fuel Research Board for 1925. H.M.S.O. Price 1*s*. 3*d*.

Report of the Commission of the Privy Council for Scientific and Industrial Research, 1925-1926. H.M.S.O. Price 3*s*.

Liverpool Cotton Association 1927. Liverpool Cotton Association.

A Geographical Reconnaissance of Trinidad. P. E. James, (*Off-print Economic Geography*, 1927, pp. 87-109.)

Rural Education. A. W. Ashby and T. G. Byles. *Clarendon Press*. Price 2*s*. 6*d*.

Immuno Chemical Studies. C. H. Browning. *Constable*, pp. 240. Price 12*s*. 6*d*.

Memorandum on Dumping. J. Viner. *Constable*, pp. 20. Price 1*s*. 6*d*.

Report of Trades Barriers Committee. League of Nations. *Constable*, pp. 34. Price 1*s*. 3*d*.

Agenda of International Economic Conference—May, 1927. League of Nations. *Constable*, pp. 22. Price 9*d*.

Solving the Farm Riddle. Jerome E. Dies. *Pascal Corvici*, pp. 148. Price $1.50.

Marketing of Agricultural Products. J. E. Boyle. *McGraw Hill Book Co.*, pp. 480. Price $3.50.

Cocoa. *Cadbury Bros. Ltd.*, pp. 48. Figs. 45.

Year-Book of Agricultural Co-operation in the British Empire. H. Plunkett Foundation. *Routledge & Sons.*, pp. 254. Price 10*s*. 6*d*.

The Construction of Cow Houses. Ministry of Agriculture and Fisheries, pp. 14. Figs. 10. Price 6*d*.

Pig Keeping. Ministry of Agriculture and Fisheries. pp. 46. Figs. 10. Price 1*s*.

A Simple System of Farm Book-keeping—2nd Edition. Ministry of Agriculture and Fisheries, pp. 20. Price 6*d*.

Canada Year-Book—1925. Dominion Bureau of States, pp. 1,080. 1 Map.

COLLEGE NEWS.

The Acting Principal and Mrs. Evans returned to England by the s.s. *Coronado* on the 14th June.

* * *

Mr. Shephard, Professor of Economics, left the island for vacation leave in England on 31st May.

* * *

Dr. Leake has tendered his resignation from the position of Principal of the College and it has been accepted by the Governing Body.

* * *

Most of the College Examinations took place between 20th June and 24th June, and Friday, 1st July, was the last day of the term.

* * *

Mr. Hardy, Professor of Chemistry, sailed for New York by the *Vandyck* on the 8th June to attend the First International Congress of Soil Science.

* * *

The Hon. H. B. Walcott, C.M.G., C.B.E., an *ex-officio* Member of the Governing Body of the College, attended a Meeting of the Governing Body in London on 6th May.

* * *

The staff and students of the College express their deepest sympathy with Mr. and Mrs. Dash on the loss of their youngest child, whose death occurred on 11th June.

* * *

During the past month Mr. J. L. Wild of Kenley, Surrey, Mr. G. E. Anderson of "Diamond" Demerara, and Mr. J. H. Kaly of Bramfield, Berbice, visited the College.

* * *

Mr. D. M. McAllister, who has been in charge of the College Experimental Factory during the grinding season left for Scotland by the *Inanda* during the third week of June.

* * *

Mr. H. A. Ballou, Professor of Zoology and Entomology, and Commissioner of Agriculture for the West Indies returned from a tour of the Northern Islands on the 22nd May. Leaving Trinidad on 16th April with Mr. Evans, Professor Ballou visited Barbados, Dominica, Montserrat and Antigua, with calls in passing at St. Vincent and St. Lucia.

* * *

The memorial stone erected to the late Mr. O. L. Thomas by the staff and students of the College and placed in the College Cemetery was unveiled on Saturday morning, 4th June, by the Acting Principal in the presence of people connected with the College and other friends of the late student. A short service was conducted by the Rev. Canon Allen.

* * *

Mr. J. S. Dodd, B.A., F.R.G.S., who spent some time in Trinidad after a tour of the United States Cotton Belt, gave an address on the work of the College at a meeting of the Oldham Chamber of Commerce, Lancashire, on 8th April. Whilst in Trinidad Mr. Dodd lectured to the Science Club and wrote an article on the American Cotton Industry which was published in the February issue of *Tropical Agriculture*.

On Monday, 6th June, a farewell dinner was given by the Heads of Departments of the College to Professor J. S. Dash, who is shortly leaving the College, to take up the duties of the appointment of Director of Science and Agriculture, British Guiana, which he has recently accepted.

The toast of the evening, proposed by Mr. Evans was the good health of Professor Dash and the best of success in the work of his new appointment. This was supported by Professor Ballou. Reference was made to Professor Dash's long experience and intimate knowledge of West Indian agriculture and his experience with agricultural methods outside the tropics.

Rising to reply Professor Dash expressed his appreciation of the co-operation of his colleagues from the time of his arrival at the College up to the present. He looked forward to the duties of his new appointment, his feelings in regard to which were mingled with regret at leaving the College.

Professor Hardy, who was departing the following day to attend the International Soil Service Congress at Washington, and Professor Ballou on his appointment as Commissioner of Agriculture, were proposed and toasted, and they suitably replied.

* * *

Mr. Geoffrey Evans, C.B.E., was entertained to dinner at the French Restaurant, Port-of-Spain, 11th June, on the eve of his departure on leave, by the members of the College Staff. In proposing the toast of the health of Mr. Evans, Professor Ballou spoke appreciatively of the excellent work done by Mr. Evans during the past College Session, when he had been Acting Principal, and expressed the hope that, in view of the conspicuous success which had marked his conduct of all the affairs of the College during that period, Mr. Evans might return to the College as Principal at the expiration of his leave.

In connection with his remark about the Acting Principal, Professor Ballou took the opportunity to refer to Dr. Leake, who after serving the College as Principal for nearly three years, had recently resigned, and expressed appreciation of the excellent and important work that Dr. Leake had done for the College, and of his enthusiasm, energy and broad outlook as to the future.

Dr. Briton-Jones supported the toast on behalf of the Staff and Mr. Croucher spoke on the part of the Lecturers.

Mr. Evans in replying expressed his thanks for the toast and his appreciation of the co-operation and loyalty of all members of the Staff in working with him for the good of the College during the past months and he emphasised the importance of always realising that the success and development of the College were the objects always to be aimed at, that the success of the College was of first importance rather than the interests or success of any individual or department.

Several other toasts were proposed, one of which was to Mr. McAllister, who has had so much to do with the very successful running of the College Factory during the season just closed.

TREND OF THE MARKETS.

[*The notes below are based principally upon running charts of the prices of the basic grades and upon general statistical information gleaned from contemporary publications and cablegrams and are intended to be a record of movements. An attempt is made, where possible, to indicate the market outlook at the time of going to press, but no responsibility for the accuracy and subsequent truth of such observations is assumed. Unless otherwise stated the prices quoted are spot, London.*]

SUGAR.—New features have been absent in the sugar market and things are marking time. Since the first three months of the year when a steady decline in standard values took place, the market has been consistently dull. One accentuating factor has been the disappointing rate of consumption. There has been less activity in crystallised raw; soft raw continues scarce and the lower grades of brown raw are slow of sale. The United Kingdom Board of Trade Returns for April show that nearly 20,000 tons more refined, and 11,000 tons more raw sugar was received than in 1926. Holland heads the list of supplies of Refined Sugar with nearly 32,000 tons, or twice the quantity received last year from that source. Czecho-Slovakia comes next with about 16,000 tons, whilst the United States shipped over 12,000 tons and Canada almost 10,000 tons. In raws, Cuba shows 46,000 tons against only 17,000 tons last year, San Domingo nearly 20,000 tons, whilst of preferential sugars 20,000 tons were received from Mauritius and over 13,000 tons from the West Indies. Current quotations (13th June), stand as follows:—Foreign 96 deg. c.i.f. 13*s.* 6*d.* cwt.; Preferential 17*s.* 3*d.*; Yellow crystals (duty paid) 30*s.* to 34*s.* 6*d.*,

COTTON.—Prices show little change and the market seems to be waiting for further developments. The poor start of the crop and the Mississippi disaster make movements very nervous. However, from the market point of view it is thought that the floods are finished as a bullish factor and discounted in price. Further influences in planting may affect price, but as the month of June is the most important from the point of view of crop progress, it is as well to make allowances if there is normal weather this year. The Circular of the Liverpool Cotton Association for 20th May mentions that cotton continues in only moderate request and that quotations of most descriptions show an advance. American middling is quoted at 8.91.

COCOA.—The market for Accra is excellent, and a good summer business is being done in West African for July and August shipment. A fair but not brisk demand is reported for West Indian cocoa. Current quotations (13th June) stand as follows: Trinidad L.L.T. per cwt. 83*s.*-85*s.*; Grenada L.L.T. 80*s.*

COFFEE.—The recent consistent demand for coffees of quality still pervades the market and values continue to show an upward tendency. Soon the whole of the Costa Rica crop will have been landed, and, with little prospect of the abatement of demand for finer qualities, lower prices seem rather remote. Kenya coffee has included a good deal of second rate, but sales have been free. During the fortnight ending 19th May, sales of fair Blue Mountain were made up to 213*s.*, good ordinary Jamaica was dull and valued about 90*s.*

TEA.—There is excellent business. The modest Empire preference does not suffice to prevent the competition of Java (av. 14.73*d.*) and Sumatra (av. 19.94*d.*) being very keen. The chief averages of the week ending 21st May were Ceylon 21.25*d.* Indian 19.74*d.*, Assam 20.09*d.*, and Darjeeling 20.91*d.*

RUBBER.—The average 1-14th May of the new quarter, 19.80*d.* seems a very fair price to sustain. Stocks are relatively large and consumption is below the average.

SPICES.—The *Pepper* market is quiet. Only small parcels of low and medium descriptions of new crop Jamaica *Ginger* have arrived; the quality is poor and the price too. *Pimento* has unexpectedly become dearer and there is nothing offering below 8¼*d.* per lb. *Cassia* and *Cinnamon* are quiet and unchanged. East Indian *Nutmegs* are offering rather lower, West Indian 18th June stand at 1*s.* 1½*d* per lb.

GRADING OF TRINIDAD CACAO.

THE movement for the inspection and certifying of Trinidad cacao has been dealt with in several previous issues of *Tropical Agriculture*. The Chamber of Commerce rejected the scheme whether organised on a voluntary or compulsory basis. The Agricultural Society at its meeting on 8th July, 1926, appointed a Cacao Inspection Board to deal with the subject of voluntary inspection, it being decided to issue certificates for one grade only, namely Plantation, which should be clean and a fair average of the season at the time of shipment. At the meeting of the Society on the 14th October the Board was finally constituted, and held its first meeting on the 10th February, 1927, when a provisional list of Inspectors was adopted, together with the form of Certificates to be issued. A notice was inserted in the local Press to the effect that the Board was prepared to undertake the inspection of cacao on application to the Secretary of the Agricultural Society. To date the Cocoa Planters' Association is the only body which has availed itself of the facilities offered, and about 9,000 bags of inspected and certificated cacao has been exported. It is anticipated that as the value of these certificates becomes better known exporters will be compelled by pressure from buyers overseas to adopt the same system of having their cacao certified by an independent inspector.

C. Y. S.

Readers are requested to inform the Editor immediately of any change in address.